

OUTLINE SHEET 3-12-1

Main Shafting

A. Introduction

Propulsion devices such as propellers requires the use of main shafting to move the ship through the water. This lesson details the major components of the main reduction gear, main shafting, and propeller.

B. Enabling Objectives

3.34 **DESCRIBE** the component parts of a ship's main shafting.

3.35 **STATE** the purpose of the main reduction gear.

3.36 **STATE** the types of propellers.

3.37 **STATE** the component parts of a propeller.

C. Topic Outline

1. Introduction
2. Overview
3. Propeller
4. Sections of the Main Shafting
5. Main Reduction Gear
6. Summary and Review
7. Assignment

ASSIGNMENT SHEET 3-12-2

Main Shafting

A. Introduction

This material is to be completed prior to the material being covered in class.

B. Enabling Objectives

Refer to enabling objectives in Outline Sheet 3-12-1.

C. Study Assignment

1. Read Fireman NAVEDTRA 12001, pages 8-1 to 8-8.
2. Read Information Sheet 3-12-3

D. Study Questions

1. What prevents water from leaking into the ship where the main shafting penetrates the hull?
2. What is used to reduce turbulence around the outboard flanges?
3. What is a bull gear?

INFORMATION SHEET 3-12-3

Main Shafting

A. Introduction

This information describes main shafting, propellers and main reduction gears.

B. Reference

Fireman NAVEDTRA 12001

Principles of Naval Engineering NAVEDTRA 12960

C. Information

- I. A ship moves through the water by means of propulsion devices such as propellers.
 - A. The screw-type propeller is the propulsion device used in almost all naval ships.
 1. The screw-type propeller consists of a hub and blades spaced at equal angles about the axis.
 2. The root of the blade connects the blade to the hub.
 - B. A screw propeller may be either fixed-pitch or controllable- pitch.
 1. The pitch of a fixed-pitch propeller cannot be altered during operation.
 2. The pitch of the controllable-pitch propeller can be changed at any time using controls found in the bridge or engine-room. The blades are mounted so each one can turn on a shaft mounted in the hub.
- II. The main shaft extends from the propeller to the main reduction gear. It is made of forged steel and is usually hollow when the diameter is more than six inches.
 - A. The thrust developed on the propellers is transmitted to the ship structure by the main shaft through the thrust bearing.
 - B. It is supported and held in alignment inside the ship by spring bearings.
 - C. It is supported and held in alignment outside the ship by the strut bearing.
- III. The main propulsion shafting is composed of several sections.
 - A. The propeller shaft or tail shaft is the section where the propeller is mounted.
 - B. The stern tube shaft penetrates the hull of the ship through the stern tube.
 - C. The line shaft connects the thrust shaft to the stern tube shaft, when the thrust bearing is inside the main reduction gear.
 - D. The thrust shaft transmits the thrust to the main thrust bearings.

- IV. The sections of the main shafting are joined together by bolts through flange couplings.
 - A. Circular steel or composition sleeves, known as fairwater, are secured to the outboard flange coupling to reduce turbulence.
 - B. Fairwaters are also installed on the stern tube and the strut.
- V. The main reduction gears reduce the high speed of the turbine to the low speed required by the propulsion shaft and the propeller.
 - A. A combination of gears is called a train.
 - 1. The driving gear is called the pinion.
 - 2. The driven gear is called the reduction gear.
 - B. Reduction gears are classified by the number of steps used to reduce speed and the arrangement of gearing.
 - 1. A single reduction gear decreases speed in one step. In this type of arrangement, a pinion or pair of pinions driven by the engine shaft directly drives the gear that is on the main propulsion shaft.
 - 2. A double reduction gear decreases speed in two steps.
 - a) In this arrangement, the first reduction pinion drives the first reduction gear.
 - b) The first reduction gear is connected to the second reduction pinion.
 - c) The second reduction pinion drives the second reduction gear, which is also known as the bull gear.
 - d) The bull gear is on the main propulsion shaft.

DIAGRAM SHEET 3-12-4 Main Shafting

